PATENT SPECIFICATION

(11) 1 576 075

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(21) Application No. 15170/77 (22) Filed 12 April 1977
(31) Convention Application No. 24133/77
(32) Filed 12 April 1976 in
(33) Australia (AU)
(44) Complete Specification published 1 Oct. 1980
(51) INT CL³ B05B 9/04 1/30 1/34 F04B 19/04//21/02
(52) Index at acceptance
B2F 10D1B 10F1EY 10F2DY 12A 1A
F1A 1A2 1A3 3A1A 3F1B1 4L 4Q 4S4 4SX

(19)

(54) PORTABLE SPRAYING DEVICE

(71) We, UNION CARBIDE AUSTRALIA LIMITED, a Company incorporated under the laws of the State of New South Wales, Commonwealth of Australia, of Union Carbide Building, 157—167 Liverpool Street, Sydney, N.S.W., 2000, Australia, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The present invention is concerned generally with a portable spraying device for dispersing liquids.

Recently there has been widespread concern regarding the effect on the environment, particularly the upper atmosphere, of fluorocarbons released to the atmosphere by the use of aerosol packaging to dispense a wide variety of products in the form of a spray or mist. One particular object of this invention is to provide a device which will dispense such liquid products in a similar spray or mist form without the use of chemical propellants or the need for a pressurized package.

In accordance with this invention there is provided a portable spraying device for liquids comprising means for converting a source of rotary motion into reciprocating motion, said means being adapted at one point to be permanently or demountably attached to the source of rotary motion and at another point being attached to and capable of operating the piston of a force pump, said piston being arranged to move in a cylinder formed in a body member, a side passage in said body member for connecting the cylinder to a reservoir for the liquid to be sprayed, said side passage being so located as to be open to the cylinder on the withdrawal stroke of the piston and to be closed by the piston on its forward stroke, said cylinder being connected, at or near its end remote from the piston, to a chamber open to the atmosphere by one or more perforations therein, a non-return valve located between said cylinder and said chamber, said valve allowing restricted forward movement only of the liquid under pressure during the forward stroke of the piston, means located in said chamber between said non-return valve and said perforation or perforations for imparting a swirling motion to the liquid propelled by the force pump prior to its being released as a spray through the perforation or perforations.

It is to be clearly understood that the present invention as well as being directed to the spraying device defined in the preceding paragraph also extends to (i) the combination of the spraying device and a container for the liquid to be dispensed, (ii) the combination of the spraying device and means supplying the source of rotary motion, and (iii) the combination of the spraying device, a container for the liquid and the means supplying the source of rotary motion.

In a particular preferred form of the invention the source of rotary motion comprises an electric motor driven by a battery of dry cells. Such an assembly may conveniently be mounted in a pistol-grip type housing for ease of operation.

The spraying device comprising the means for converting rotary motion to reciprocal motion, body member, piston, valve, swirl and perforated members may be formed as a disposable unit either attached to, or in a form to be attached to, a container for the liquid to be dispensed. The various integers of the spraying device may be made from any suitable material and the use of certain plastic materials such as high denstiy polyethylene for some components is envisaged as is the use of metals. The reverse pressure on the non-return valve member may arise from the inherent compressibility of the material from which it is formed, such as neoprene, or it may be applied in any other conventional manner.

In a preferred form of the invention the piston is constructed and arranged so as to move slidably within limits on a piston rod

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along the path of travel of the piston and piston rod, and in so doing perform a valving function precluding return flow of liquid on the forward stroke and allowing free passage of liquid through a gallery on the return stroke.

Said means for converting rotary motion to reciprocating motion preferably comprises a bell crank so arranged that the fulcrum thereof is located on the housing for a reciprocating member pivotally connected to the end of one arm of the bell crank, the end of the other arm of the bell crank being connected to a rotating member by a ball and socket joint at a point in or on said rotating member eccentric to the axis of rotation of said rotating member.

Reference is now made to Figure 1 of the accompanying drawings which illustrates one particular form of the invention.

In the drawing cam 1 rotates upon being driven by a battery operated electric motor (not shown). Crank 2 is demountably attached to the cam by means of ball and socket connection 3. Upon rotation of the cam the crank operates to transmit a reciprocating motion to piston 4 which moves in a cylinder 5 formed in body member 6. The cylinder 5 has a side passage 7 connecting it to a reservoir 8 for the liquid to be dispensed. During the forward stroke of the piston the side passage is closed and non-return valve 9 is opened and liquid under pressure is forced along longitudinal grooves in the surface of the valve and swirl member 10 to reach the face of the swirl member. The face of the swirl member is provided with radial grooves which act to impart a swirling action to the liquid prior to it being released as a spray or mist through perforation 12 in plug member 11.

Reference is now made to Figures 2 to 7 of the accompanying drawings, wherein:—

Figure 2 illustrates a modified form of the spraying device of Figure 1,

Figure 3 is a top view of crank 2,

Figure 4 is an end view of piston rod 13 and piston 14,

Figure 5 is a bottom view of non-return valve 15,

Figure 6 is a bottom view of swirling means 17

Figure 7 is a top view of perforated plug 18.

In the device illustrated in Figure 2 the drive mechanism imparting reciprocal motion to the piston operates in the same manner as described in connection with Figure 1.

Piston assembly 4 in Figure 2 comprises a piston rod 13 with piston 14 arranged so as to move slidably thereon within limits, and in so doing perform a valving function precluding return flow of liquid on the forward stroke and allowing free flow of liquid through a gallery on the return stroke.

The liquid is forced under pressure past non-return valve 15 into chamber 16 wherein it is given a swirling motion by swirling device 17 before being ejected as a spray or mist through perforated plug 18.

The pumping cycle of the device of Figure 2 is now more fully described as follows, to be read in concert with Figures 8*a* to *e* in which valves *x* and *y* are respectively valves 15 and 14 of Figure 2.

Notation

TDC=Top dead centre.
BDC=Bottom dead centre.
Prefix A indicates after 40° an approximation to indicate a "valve rocking" period.

Drawings 8a & e

TDC compression

Piston:	Stationary
Piston Rod:	Stationary
Valve x:	Preparing to close with falling pressure
Valve y:	Preparing to open with piston rod retreat

Drawing 8b

TDC to 40° ATDC Induction valving

Piston:	Stationary
Piston Rod:	Retreating
Valve x:	Closed due to its own resilience
Valve y:	Open allowing fluid to flow through piston galleries to chamber

Drawing 8c

40° ATDC to BDC Induction Period

Piston:	Withdrawn fully
Piston Rod:	Fully retreats
Valve x:	Closed
Valve y:	Open

Chamber is now fully charged

Drawing 8d

BDC to 40° ABDC Compression valving

Piston:	Stationary
Piston Rod:	Advancing
Valve x:	Opens with compression
Valve y:	Closed as rod drives forward

Drawing 8e

40° ABDC to TDC Compression

Piston:	Driven forward compressing fluid
Piston Rod:	Driven forward compressing fluid
Valve x:	Open
Valve y:	Closed

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Fluid is forced through swirl and nozzle.

It will be appreciated that there may be made many modifications in details of the above described embodiment within the broad scope of the invention as defined in the appended claims.

WHAT WE CLAIM IS:—

1. A portable spraying device for liquids comprising means for converting rotary motion into reciprocating motion, said means being adapted at one point to be permanently or demountably attached to a source of said rotary motion and at another point being attached to and capable of operating the piston of a force pump, said piston being arranged to move in a cylinder formed in a body member, a side passage in said body member for connecting the cylinder to a reservoir for the liquid to be sprayed, said side passage being so located as to be open to the cylinder on the withdrawal stroke of the piston and to be closed by the piston on its forward stroke, said cylinder being connected, at or near its end remote from the piston, to a chamber open to the atmosphere by one or more perforations therein, a non-return valve located between said cylinder and said chamber, said valve allowing restricted forward movement only of the liquid under pressure during the forward stroke of the piston, means located in said chamber between said non-return valve and said perforation or perforations for imparting a swirling motion to the liquid propelled by the force pump prior to its being released as a spray through the perforation or perforations.

2. A portable spraying device as claimed in claim 1 wherein said means for converting rotary motion to reciprocating motion comprises a bell crank so arranged that the fulcrum thereof is located on the housing for a reciprocating member pivotally connected to the end of one arm of the bell crank, the end of the other arm of the bell crank being connected to a rotating member by a ball and socket joint at a point in or on said rotating member eccentric to the axis of rotation of said rotating member.

3. A portable spraying device as claimed in claim 1 or claim 2 having a force pump piston assembly wherein the piston is constructed and arranged so as to move slidably within limits on a piston rod along the path of travel of the piston and piston rod, and in so doing perform a valving function precluding return flow of liquid on the forward stroke and allowing free passage of liquid through a gallery on the return stroke.

4. The combination of a portable spraying device as claimed in any preceding claim and a container for the liquid to be dispensed.

5. The combination of a portable spraying device as claimed in any of claims 1 to 3 and a source of said rotary motion.

6. The combination of a portable spraying device as claimed in any of claims 1 to 3, a container for the liquid to be dispensed and a source of said rotary motion.

7. The combination as claimed in claim 5 or claim 6, wherein said source of rotary motion comprises an electric motor driven by a battery of dry cells.

8. A portable spraying device substantially as described herein with reference to Figure 1 of the accompanying drawings.

9. A portable spraying device substantially as described herein with reference to Figures 2 to 8 of the accompanying drawings.

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Printed for Her Majesty's Stationery Office, by the Courier Press, Leamington Spa, 1980
Published by The Patent Office, 25 Southampton Buildings, London, WC2A 1AY, from which copies may be obtained.

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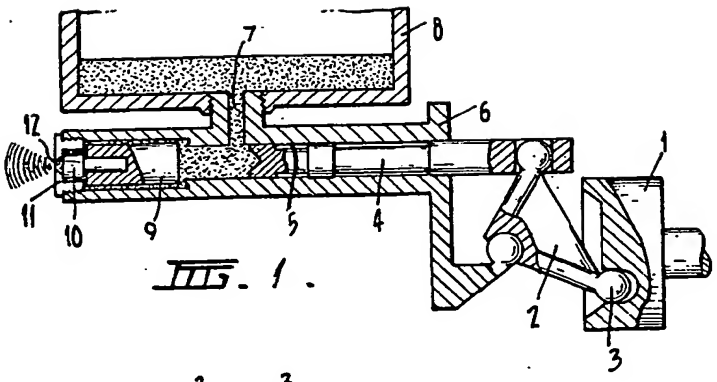

FIG. 1.

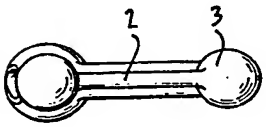

FIG. 3.

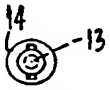

FIG. 4.

FIG. 5.

FIG. 6.

FIG. 7.

1576075 COMPLETE SPECIFICATION

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Sheet 2

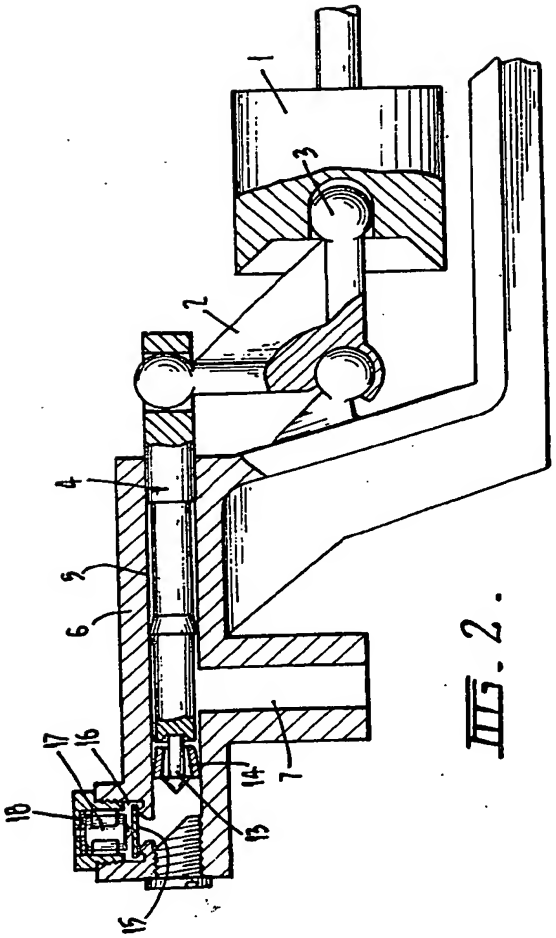

FIG. 2.

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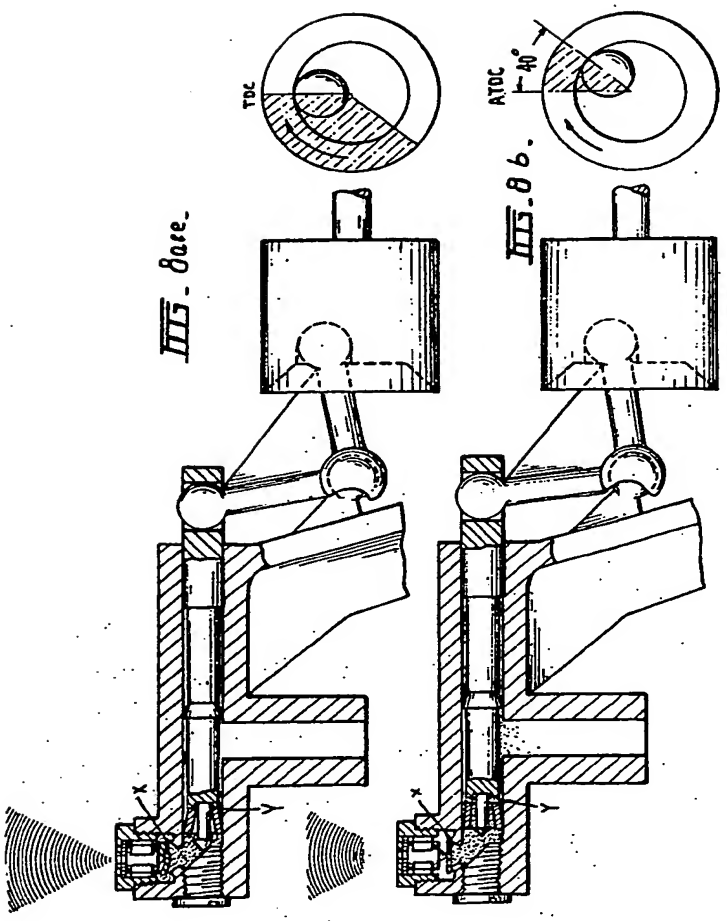

Fig. 8a.

Fig. 8b.

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Sheet 4

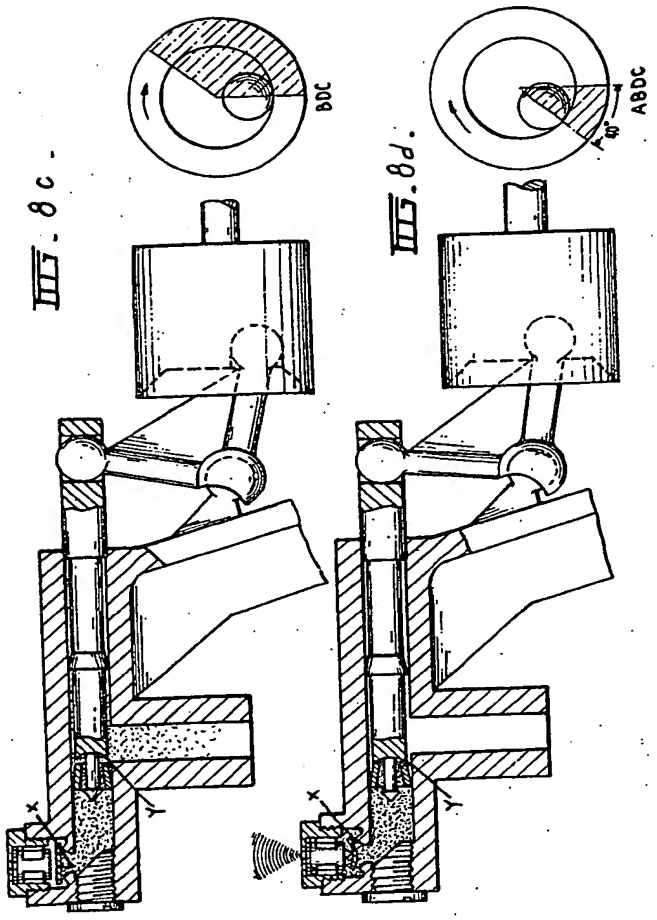

Fig. 8c.

Fig. 8d.

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